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UNIMAS RESEARCH UPDATE

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MANAGING UNIVERSITY RESEARCH: A REFLECTION

As a nation in a newly emerging k-economy, we Malaysians worry about our lack of creativity and innovation, about international technological competition, about our sluggish growth in economy. We are fearful that we will never assume a position of sophisticated technological standing so as to compete with the rest of the world successfully. Indeed improving productivity through improved technological leadership is an imperative of our times. As much as the nation is concerned about our technological progress, we at the universities are deeply troubled about current trends and events in our research and development (R&D) function; the core activity of any technology-driven institution of higher learning. The R&D part of a university provides the ideas, concepts, and thrust needed for progress to occur. We worry about high turnover among young scientists and other research professionals, about how to motivate them, about burnout and technical obsolescence, about energy wasted in internal politicking and conflict, about their personal development and career growth, about their psychic income and the balance between work, play and family.

In my years of managing R&D at two local universities, I was often overwhelmed and saddened by what I saw - a huge pool of powerful people who, for some reason, feel powerless. Universities are top-heavy organizations with powerful and highly-qualified professionals occupying the base of the pyramid in inverted position. They are people who have invested considerable time and energy in preparing for their careers; equipping themselves with enormous amount of useful knowledge and skills. They are powerful because "knowledge is power!" Yet, many amongst them are resigned to the idea of being powerless and deprived. Their energies are sapped in nonproductive activities and they are not participating in the technological progress. Wither that unquenchable thirst for knowledge and the passion for excellence in them! But why?

To be brutally honest, I attribute such misgivings to a gulf in communication between the research managers and the professionals. The managers of R&D know little about managing these professionals. The managers need to understand the schism: the values, expectations, and goals of these professionals. Researchers are knowledge workers, and they bring unique values and expectations to the workplace. Their maximum effectiveness in pushing new frontiers of knowledge can only be achieved through creation of an environment that is conducive to both their intellectual and creative discourse. They need a work environment where they can maintain and enhance their vitality. Professionals are frequently achievement-oriented individuals who seek motivation from the work place itself. A high level of autonomy in managing their own work is important to them. They are sensitive to the quality of the work environment, climate and culture. It is because of these unique personal sentiments and requirements that they chose to work for institutions offering them a high psychic income that embodies deeply-rooted satisfactions like learning, achievement, impact and a sense of self-worth.

It is for this reason also that any attempt to apply ideas learned from conventional management gurus of today is often met with failure. At times I feel that R&D scientists, engineers and programmers need no managing at all. It seems as though the absence of management is what the

The Editor bids *farewell*

"To all Unimas staff, soon I will no longer be in the position to expect all the best FROM you but only to hope all the best FOR you!"

".....that drug discovery from our biodiversity is an imperative that cannot be postponed or stymied because of our own megalomania and persecutory complex that tend to over-protect our biodiversity. Indeed Malaysia's healing gift to the ailing world today may just come from the richness of our biodiversity but that can only be realized through research collaboration of scientists from both resource-rich and technology-rich nations of the world."

professional wants. Self-management has been almost synonymous with being a professional. But this turns out to be an overstatement. Much of the work of R&D is uncharted and often unpredictable. The professionals rely on mission and goals to provide the *raison d'etre* for their R&D work. It is at this level that R&D managers play their role in encouraging the knowledge workers to own and understand the university's goals and, in the long run, to achieve congruence between their own goals and those of the university. Researchers and innovators are usually not in a position to have a bird's-eye view of the role of universities in regional economic, social and cultural development. It is therefore the responsibility of R&D managers to ensure the potential of university research is maximized within these perspectives. Among the intricacies saddled by R&D managers include providing opportunities for the best and brightest researchers and innovators, supporting and rewarding research excellence, building critical mass in areas of opportunity and capitalizing on the returns on investment in R&D.

Since its establishment 8 years ago, Unimas has kept pace with the global revolution in knowledge production and its use. It has become an attractive site for R&D investment. Our own researchers have played a crucial role in transforming Unimas, within a short span of time, into a strong and vibrant research university. At Unimas, the term R&D researchers are not used within the limited scope for scientists and engineers only, but include other professionals: programmers, who can make computers do our bidding; psychologists, whose work helps us to relate to and use computers; economists, who calculate costs; cognitive scientists and ergonomists, who design work environments, writers and linguists, who create instructions for the eventual user; artists, who work on creative packaging and make the product esthetically appealing; and many others. These individuals are the driving force for progress, generators of creative ideas and innovations. They are, in actuality, the knowledge workers – people whose work is with ideas, concepts, and technical information specific to their role. Not only they have emerged as leaders in producing fundamental knowledge, they have also been instrumental in disseminating new knowledge to the community, and providing training for the researchers of tomorrow. Within this context and after its brief existence to date, Unimas has impacted a fundamental and far-reaching shift in the nation's capacity to support the ever-growing knowledge-based and emerging enterprises.

DIGITAL DIVIDE: UNIMAS TAKES THE BULL BY THE HORNS

As our generation moves into the era of advanced telecommunications and information services, we must maintain our strong commitment to establishing what has been referred to as "a universal service system" – that is to say simply "making access to the computers as universal as telephones are now". We cannot forget all the benefits we have enjoyed when telecommunication services became almost ubiquitous – any of us can call nearly anyone from nearly anywhere. All of us have benefited hugely from the telecommunication revolution.

Today the Internet is becoming more and more central to our telecommunication system. The Internet has opened up new doors of opportunity for many young nations of the world today. There is a gush of excitement, fear and dreams, all in one, of people in developing countries to chart new pathways in exploring new economic, social and cultural opportunities through the conscious use of the Internet. Indeed a very exciting moment in which the potentials are only limited by human imagination.

But we all know that there are people in many places of our respective countries today who will not be able to fully participate in this new economy, social and cultural development, health and educational services, until and when we close the so-called digital divide that

seems to be widening - leaving a large gaping hole between the parting futures of the urban and the rural communities.

In the past year, a cadre of researchers from Unimas decided to bring into sharper focus this most overriding and pressing concern to the fore - the digital divide between urban and rural areas – a common concern that can never be overstated. They have chosen Bario as their experimental site for the introduction of IT. Bario lies 1,200 meters above sea level, on a plateau in the Kelabit Highland, southeast of Miri in the Fourth Division of Sarawak. This Kelabit country is effectively shielded from outside cultural and socio-economic influences because it is encircled by a continuous rugged mountain ranges and stretches of rich tropical rainforests. The Kelabits have been traditional rice growers for centuries, notably the aromatic 'Bario rice' which is regarded as a form of rare delicacy in Malaysia. Today, the 5000 or so Kelabits living in this highland are at the crossroads of change. Outward migration of its own people and the migration of workers from across the Indonesian border, have significantly altered the population distribution of this once self-sustaining and peaceful community. Its agricultural economy, rich cultural heritage, inaccessibility by road and river transport and the remoteness of the highland – all these present a wide field of opportunities to Unimas researchers.

Of critical concern is to address ways and means to overcome the obstacles of distance – a disadvantage and a constrain than is true to life in the settings of remote, rural and sparsely populated areas such as Bario. Unimas researchers became pioneers, explorers and leaders who were building the rivers of communication – the rivers of commerce through a network of wires, cables, optic fibers and radio waves – to benefit the rural folks and children of Bario in a manner that was never before possible. Indeed it has been argued, when talking about world equity, that just focusing on access to computers is a skewed and narrow perspective of looking at the problems of the world today.

Ted Turner, the owner of CNN for instance, had said that getting computers out to everybody is not going to do much in a way of achieving global equity when these people don't have enough medicines, they're dying and they don't have electricity and proper water supply. "Why are we just sitting here talking about computers?" he lamented at an economic forum to discuss global equity. Bill Gates himself voiced his view on the matter and found the need to prioritize his philanthropic activities. "Health first, then literacy and finally IT" was Bill Gates newly found inspiration. He argued that good health will bring about the opportunity for education and literacy. Once you have literacy then you have a chance to bring in the new tools of communication – computers and other latest advances in telecommunication.

Unimas researchers refuse to allow such demented views distract them from the broad goals of bringing IT to the indigenous Kelabit community of the Bario Highland of Sarawak. They are committed to do their part. ICT has the potential to propel us into an era of fundamental economic transformation. Information Age can run through every city, every town and every community. In fact, the more communities they run through the better it works. No one has to be bypassed this time around. The choice is in our hands. We can use new technology to extend opportunity to more people in this country than ever before; we can truly move people out of poverty more rapidly than ever before.

Our refusal to recognize the imminent danger of widening rural digital divide and our failure to keep the problems associated with rural digital divide at bay, simply mean that we are allowing access to new technology to heighten economic inequality and sharpen social division. The choice is ours. Every economist knows that new technologies will continue to drive rapid economic growth only if they continue to spread to all sectors of our economy. It will take the enlightened energy of people like those of Unimas researchers to change the course – to put a stop to the vicious cycle of poverty amongst our rural communities. Rural life is still the norm for the majority of mankind. A little over 55% of the world's population live in rural settings. The majority live in less developed countries of the world and in Asia, more than 75% of the population can be classified as rural.

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Recently, Unimas organized an international conference in Kuching to learn and discuss diverse and innovative approaches used in search for solutions to bridge the digital divide among rural communities. The approaches and solutions may vary in many dimensions - lending testimony to the multi-dimensional characteristic of the problems that rural people in different areas of the world face. The deliberations, articulation of ideas and sharing of experiences at the conference have galvanized Unimas position and resolve to permeate the rural communities so that they too can master the new technologies and fully participate in the fundamentals of the information revolution.

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If at all we have learned anything about computers, in their remorseless intrusion into our daily lives, then it's this: technology alone has never solved a single problem. It is the actions of the people who use the technology, and of the institutions within which they shape their lives that bring solutions to the places where they are needed. Delivering technology to the have-nots is not even half the problem, it's making good use of it that presents the real challenges.

So, while we continue to applaud the achievements of the miracle-workers at Intel, Microsoft, Compaq, Nokia, Cisco and among all the other major ICT manufacturers, we must apply our minds to the enormous problems of rural life and how these can be overcome in a robust and sustainable manner in a way which, incidentally, makes use of ICTs. Rural digital divide is not an insurmountable problem. There is no better place to start closing the digital divide than at the bottom, when the alternative is only likely to lead to closing it in one place but at the same time making it wider in another place. Because of the tremendous change in technology today, we are presented with an opportunity to take this information and communication services to a whole new level. This is a new world and we are very fortunate to be part of it.

HIGHER EDUCATION: ELITIST NO MORE!

In the last decade or so, some academics are thinking back fondly to the extensive and far-reaching change that has been taking place within our own university education. Generally our higher education system today is more open, socially responsive and less elitist, both in concept and practice. Consequently, on campus today we see more women students, more mature-age students, more part-time students, more disabled students, more students from minority ethnic backgrounds like the Orang Asli and the Penans, and more exchange or foreign students. The faces we see on local campuses begin to mirror more of those we see on the streets and workplaces of Malaysia. In fact it is now becoming to look much more like Malaysia as a nation. Admission to a university is now more like a civic right, more like getting a driver's license, and less like joining an exclusive club.

Some may have argued that this shift in higher education has been imminent and inevitable anyway. But it would not have taken place in such a rapid and recent pace without the advent of technological changes that we ourselves have embraced in the last 10-15 years. At Unimas we have long been ready and willing to seize these changes with enthusiasm, intelligence, and hard work. Way back when we first established our home-base in Kota Samarahan, we sounded the alarm on how we must use IT then or come out as losers in today's competitive world. Right from the outset, we have maintained our strong commitment to establish what has been referred to as a "universal service system". Our aim was to make access to computers as easily, as affordable, as ubiquitous and as indispensable to everyone as the telephones! We strive to enliven a scenario where you just don't leave home without your computer. We aim to make learning possible to anyone, any time, anywhere in just about any subject.

In Malaysia, the use of Information and Telecommunication Technologies (ICT) to educate our children has been not just a political choice, but also a philosophical discourse. Our government has been focusing on the provision of adequate infrastructures and support facilities for accelerating the integration of technology in education at all levels. MIMOS was

established and then the Multimedia Super-Corridor – the acronym MSC soon after became a household jargon. We see the exciting potentials of using the ICT in extending the boundaries of teaching and learning as being limited only by our own imagination. The ICT has opened up new doors of opportunity for all of us to pursue, evaluate, communicate and apply knowledge. It's a matter of unleashing our creativity and ingenuity and again, we see the bright blue sky as the only possible limit!

Rapid technological changes, particularly in the ICT, are affecting both university and school teaching-learning activities in three compelling ways. First, they are producing new curriculum content. Second, they are modifying traditional classroom teaching modes and situations. Third, they are transforming the very nature of the way knowledge itself is acquired. There are more part-time students pursuing their education through distance learning. Through their personal computers, they are accessing knowledge from vast databases available not from the teacher but the public domain of the Internet. They interact with other students across national boundaries. People are able to undertake formal as well as informal learning through a range of delivery systems reaching to home and workplace.

All these new modes of providing education and acquiring knowledge represent a shift towards what is now called "guided resource-based learning" – that is, " learning from any source other than direct contact with a teacher in real time." All materials and methods developed for such "guided resource-based learning" will increasingly be used to enhance on-campus learning environment. We must ensure that in our conscious attempt to provide creative and innovative teaching and learning, our own enthusiasm does not in any way detract us from our commitment to personal contact and time-tested teaching methods where they remain appropriate and relevant to specialized disciplines like medicine and engineering. This way, we hope that, in the long run, "life-long learning" is not merely a pleasant-sounding slogan, but truly becoming a more and more attractive choice and passion for everyone.

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ENVIRONMENTAL MICROBIOLOGY

POTENTIAL BACTERIAL PATHOGENS IN REARED FRESHWATER FISHES

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With the tremendous growth in the aquaculture industry, increased attention has been given to the possibility of fishes acting as vector of human enteropathogenic bacteria. A wide range of bacteria has been isolated from various types of fish species both from tropical and temperate waters. There are indications that the types of bacteria carried in the gastrointestinal tracts of fish are related, to a certain degree, to the level of contamination of the water by enteric bacteria. The bacterial flora of fish reflects the bacteriological quality of the water from where the fish originated. The majority of these bacteria are carried in the gastrointestinal tract and they are of primary significance as a source of occupational diseases in fish handlers.

The presence of certain bacterial species such as *Salmonella, Escherichia coli* and *Staphylococcus aureus*, known to be the cause of enteric and other infectious disease, on the flesh of fish indicated that they have the potential of causing human diseases when consumed or handled. The sporadic cases of tropical diarrhoea in humans could be attributed to infections by *Edwardsiella tarda* and *Pleisomonas shigelloides*. The infections could be traced to have originated from handling or consumption of contaminated freshwater fish. There are close relationships between bacteria and many ecological factors in fish ponds such as dissolved oxygen, suspended matter,

organic detritus, transparency, planktons and nutrient salts which show either positive or negative correlation.

A study was undertaken by Dr Kasing Apun on the bacterial species in fishes reared in two ponds with different management systems. Identification of bacterial species in the water samples from the ponds and the dam revealed the presence of 16 bacterial species including *Aeromonas hydrophila, Citobacter freundii, Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae, Pseudomonas sp., Bacillussp., Listeria monocytogenes* and *Staphylo-coccus sp.* A total of 16 bacterial isolates was also found in the organs of fish studied, primarily in the intestines of all fish species. The most number of bacterial isolates (14 isolates) were detected in the intestine of the fish *Puntius schwanenfeldii*. The bacterial species found in the intestines of the fish samples appeared to be similar to those found in the water samples obtained from the ponds. Analysis of the relationship between the microbial content of the water and the fish organs indicated that generally the bacterial species isolated from the pond water could also be isolated from the intestines of the 4 fish species examined. The strong correlation between the bacterial species present in the pond water and the fish organs, regardless of the fish species, also suggested that the surrounding water influenced the composition of the microbial flora of the fish. This was further supported by the observation that fish grown in unpolluted freshwater ponds did not harbour bacteria in their muscle or flesh. However, some potentially enteropathogenic bacterial species were recovered from the intestines. Their presence in the digestive tract of these indigenous fish species reinforced the need for proper handling of the fish, especially in the removal of the digestive tract. During the removal, the content of the digestive tract can be spilled and contaminate the cavity of the fish and the handlers' hands. Although fish are rarely consumed raw, any mishandling can lead to the possible transmission of potential pathogens to human.

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Reference:

Kasing Apun, Asiah Yusof and Kumbang Jugang.(1999) Distribution of bacteria in tropical freshwater fish and ponds. *Int. Journal Environmental health Research* 9 , 285-292

MATERIAL SCIENCE

NOVEL ELECTRODE MATERIAL FOR THIN-FILM ULTRACAPACITORS

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Electrochemical capacitors are charge-storage devices that possess high power density, exhibit excellent reversibility, and have very long cycle life. Potential applications of electrochemical capacitors include load-leveling functions for batteries in electric vehicles during starting, acceleration, and regenerative braking and burst-power generation in electronic devices such as cellular phones, camcorders and navigational devices. Many charge-storage mechanisms have been proposed for electrochemical capacitors, most notably double-layer capacitance and charge-transfer-reaction psedocapacitance. The large specific capacitance of ultracapacitors is the result of one or a combination of these charge-storage mechanisms. Double-layer capacitance arises from the separation of charge at the interface between a solid electrode and an electrolyte, whereas pseudocapacitance arises from fast, reversible faraddaic reactions occurring at or near a solid electrode surface over an appropriate range of potential. Much research in this area has been focused on the development of electrode materials having high specific surface areas, such as carbon and transition-metal oxides. Carbon-based systems are thought to function as double-layer capacitors due to their high specific surface areas (about 2000 m2/g). Carbon has been found to suffer, however, from slow

deterioration by oxidation and from high internal resistance.

Many transition-metal oxides have been shown to be excellent electrode materials for ultracapacitors with their charge-storage mechanisms based predominantly on pseudocapacitance. Recently, a hydrous form of ruthenium oxide in aqueous H_2SO_4 has been found to possess very high specific capacitance (720 F/g), which is associated with redox reactions that go beyond the surface and penetrate into the bulk of these materials. Although the ruthenium-oxide system gives very high specific capacitance, it has the inherent disadvantage of being both expensive and toxic. It was reported that the specific capacitance of cheaper nickel-oxide systems in aqueous lithium hydroxide (LiOH) can be as high as 265 F/g. Srinivasan et al. have also reported electrodeposited porous nickel oxide electrochemical capacitors with comparable specific capacitance.

While the utility of MnO_2 in batteries has long been recognized and well established, its potential application as an electrode material for ultracapacitors has not been extensively studied. Suh-Cem Pang of Unimas and his supervisor Marc Anderson of University of Wisconsin-Madison believe that the natural abundance of manganese oxide coupled with its environmental compatibility make it a very promising electrode material for various energy-storage technologies and, in particular, ultracapacitors. Based on their previous experience in developing nanoparticulate Ni_xO/Ni ultracapacitor systems, they continued their effort in the search for more economical and environmentally friendly electrode materials for the fabrication of ultracapacitors. They have reported their comparative findings on the electrochemical properties of sol-gel-derived nanoparticulate and electrochemically deposited hydrous MnO_2 thin films on nickel foils in unbuffered Na_2SO_4 solution. Thin films of manganese dioxide were formed on nickel foils by electrodeposition and by both dip-coating and drop-coating with manganese dioxide suspensions (sols) and their subsequent gelation and calcinations. Sol-gel-derived nanoparticulate manganese dioxide thin films on nickel foils have been shown to be an outstanding electrode material for the fabrication of ultracapacitors. Its high specific capacitance, coupled with its low cost and environmental friendliness, offer greater advantages over other transition-metal oxides that are currently being used for this purpose. Further optimization in the cycling behaviors of manganese dioxide thin films is envisaged through better microstructural control as well as the deposition process for obtaining optimum film thickness and uniformity.

"Sol-gel-derived nanoparticulate manganese dioxide thin films on nickel foils have been shown to be an outstanding electrode material for the fabrication of ultracapacitors. Its high specific capacitance, coupled with its low cost and environmental friendliness, offers greater advantages over other transition-metal oxides that are currently being used for this purpose"

Reference:

Suh-Cem Pang, Marc A Anderson and Thomas W Chapman (2000) Novel electrode materials for thin-film ultracapacitors: Comparison of electrochemical properties of sol-gel derived and electrodeposited manganese dioxide. *Journal of Electrochemical Society*, 147 (2) 444-250

MEDICAL

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RARE RUPTURE OF BICEPS FEMORIS TENDON SUCCESSFULLY REPAIRED ALBEIT DELAY IN TREATMENT

Spontaneous rupture or avulsions of the biceps femoris tendon is rare. The first case was reported in 1990. Subsequently, four other similar cases of tendon rupture of the biceps femoris have been described. With the exception of one, all patients of these cases were seen immediately by orthopedic surgeons and treatment was given when the rupture was in the acute phase. In all this cases, surgical repair of the tendon has been carried out successfully. Drs Pan and Ting of Unimas recently encountered a case of rupture of the biceps femoris tendon in a 33-year old male who had inadvertently delayed treatment for as long as four months. The tendon rupture occurred after he missed a powerful kick in a soccer game. Although the rupture was attended to after months of neglect by the patient himself, surgical repair of the tendon was carried out successfully. The biceps tendon was found to be completely avulsed from the fibular head and was retracted 7cm proximally. The muscle

"Although the rupture was attended to after months of neglect by the patient himself, surgical repair of the tendon was carried out successfully ... This feat differed from previously reported cases of biceps femoris tendon rupture where immediate treatment were given in the acute phase of the avulsions."

was mobilized. The tendon was then repaired by placating it with non-absorbable sutures and fixing it to the fibula head through the drill holes. Postoperatively the knee was immobilized with a posterior plaster splint at 80 degrees flexion. After two weeks, this was gradually extended with cast changes until 15 degrees of flexion was achieved at six weeks at which point unrestricted knee range of motion exercises were started. At six months, full range of movement of the knee had been achieved and although the patient had not returned to sporting activities, there was no longer any difficulty in getting up from a sitting position, driving a car or negotiating the staircase. In missing the attempted kick on the soccer ball, our patient had forcibly flexed his hip and inadvertently extended his knee to a greater degree than intended. This had stretched the hamstrings while they were in contraction. This feat differed from previously reported cases of biceps femoris tendon rupture where immediate treatment were given in the acute phase of the avulsions. In summary, Drs Pan and Ting have shown that it is possible to bridge a gap of 7cm by using incomplete cuts of the tendon at the musculo-tendinous junction and by flexing the knee acutely. After two weeks, the knee should be gradually straightened out to prevent a flexion contracture.

Reference:

Pan K L and F Ting (2000) Delayed repair of rupture of the biceps femoris tendon – A case report. *Med J Malaysia* No3: 368-370

HIGHLY CONSERVED T-CELL EPITOPES FOR POTENTIAL MALARIAL VACCINE

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"...the HLA-degenerate T-cell epitopes of P. falciparum LSA-1 are highly conserved in field isolates from geographically diverse regions with varying malaria transmission patterns.... Their present data therefore underscore the potential of including these HLA-degenerate T-cell epitopes of LSA-1 in a subunit vaccine."

Malaria remains a disease affecting millions worldwide largely due to the widespread development of drug resistance by the parasite and insecticide resistance by the mosquito vector. Various approaches to develop an appropriate malaria vaccine have been initiated, including one that elicits antigen-specific T-cell responses against pre-erythrocytic antigens of *Plasmodium falciparum*. A vaccine targeted at the pre-erythrocytic stages would prevent further parasite development of the asexual erythrocytic stages associated with pathology and sexual stages responsible for transmission.

Liver stage-specific antigen-1 (LSA-1) is a prime candidate vaccine antigen and five T-cell epitopes that are degenerately restricted by HLA molecules common in most populations have been identified on LSA-1. Considerable evidence has implicated $CD8^+$ T-cells as critical effector cells in protective immunity against pre-erythrocytic stage malaria. These $CD8^+$ T-cells recognize parasite-derived peptides that are presented in association with class I human leucocyte antigens (HLAs) on the surface of infected hepatocytes. This recognition process where HLA's are involved further complicates the vaccine development for malaria. Genetic polymorphism of HLA molecules represents a major obstacle to the development of an epitope-based vaccine designed to induce protective T-cell immune responses. Polymorphisms within defined $CD8^+$ T-cell epitopes on pre-erythrocytic stage antigens can abrogate the host immune response to *Plasmodium* spp. parasites. Therefore, as a prerequisite for inclusion in a subunit vaccine, selected T-cell epitopes must be conserved.

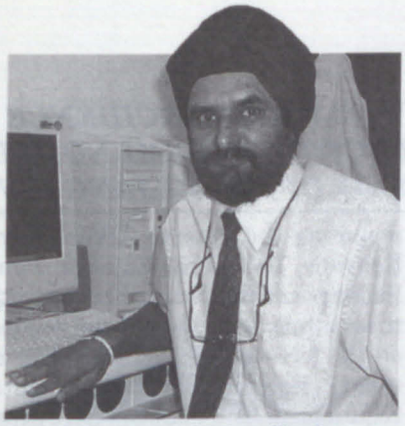
A team of researchers including Dr Janet-Cox Singh of Unimas investigated the extent of polymorphism within these T-cell epitopes. They looked into the polymorphism of HLA-degenerate T-cell epitopes identified on *P. falciparum* liver stage-specific antigen 1, a prime candidate for subunit vaccine development. The N-terminal non-repetitive region of the LSA-1 gene from Malaysian *P. falciparum* field isolates was sequenced and compared with data of isolates from Brazil, Kenya and Papua New Guinea. Their analysis revealed a similar degree of conservation for three of the five epitopes, ELS1, ELS2 and ELS3. Epitope ELS5 was almost completely conserved, with no polymorphism in any of the 10 Papua New Guinean and 11 Kenyan isolates, but a single point mutation was observed in one of the 10 Brazilian isolates.

Their data for *P. falciparum* isolates from Malaysia, a newly studied population, and those obtained for isolates from Brazil, Papua New Guinea and Kenya clearly indicate that the HLA-degenerate T-cell epitopes of *P. falciparum* LSA-1 are highly conserved in field isolates from geographically diverse regions with varying malaria transmission patterns. This differs from the well-established sequence polymorphism seen with other pre-erythrocytic stage antigens, namely the circumsporozoite protein and the thrombospondin-related adhesive protein. Such observations argue for a structural or functional role for LSA-1. Their present data therefore underscore the potential of including these HLA-degenerate T-cell epitopes of LSA-1 in a subunit vaccine.

Reference:

Manickam Ravichandran, Denise L Doolan, Janet Cox-Singh, Stephen L Hoffman and Balbir Singh (2000) HLA degenerate T-cell epitopes from *Plasmodium falciparum* liver stage-specific antigen 1 (LSA-1) are highly conserved in isolates from geographically distinct areas. *Parasite Immunology* 22 : 469-473

SENSITIVE PCR TECHNIQUE FOR DETECTING MALARIAL PARASITES IN MOSQUITOS



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Malaria is still endemic in some tropical countries in the world. Evaluation of malaria campaigns is based not only on detection of parasites in patients but also on monitoring the infection of mosquito populations. Traditionally this has involved the dissection and microscopic examination of hundreds of mosquitos which is time consuming and labor intensive. Although, this method yields reliable results, it does not distinguish between *P. falciparum* and *P. vivax*. Other techniques have been developed to overcome these difficulties. With the advent of monoclonal antibodies specific to circumsporozoite (CS) antigens, an enzyme linked immunosorbent assay (ELISA), has been developed and shown to be a useful tool for the detection of *P. falciparum* and *P. vivax* in the mosquito vectors. An ELISA kit is now available and field evalutions demonstrated excellent correlation between ELISA positivity and salivary gland infection rates assessed by dissection. However ELISA fails to detect immature sporozoites present in oocystes and it has been reported that circumsporozoite (CS) proteins in excess of those incorporated in sporozoites can be found in infected mosquitos resulting in sporozoite number being overestimated.

As an alternative to ELISA, attention has been focused upon the development of diagnostic methods based on deoxyribonucleic acid (DNA) probes and polymerase chain reaction (PCR) for detection of parasites in mosquitos. Although DNA probes can be species specific and allow a large number of samples to be identified, sensitivity has been limited. Over 1,000 sporozoites per mosquito are required for reliable detection even with highly repetitive DNA probes. The most recent and exciting development in the field of recombinant DNA technology has been the polymerase chain reaction (PCR). By using PCR, it is possible to synthesize *in vitro*, millions of copies of a specific target DNA sequence. It has been discovered that there are some regions of the sequences coding ssrRNA are specific to the parasite species from which they are derived. These regions were put to use for the designing of primers suitable for use in PCR amplification technique. Since malaria occurs in undeveloped areas, it is important to have simple method of DNA extraction. Very little work has been carried out using nested PCR on mosquitos, especially wild caught mosquitos. Balbir Singh of Unimas, together with his collaborators, described a simple method for the isolation of DNA from dried mosquitos and nested PCR using genus and species specific primers.

In their study, ELISA and nested PCR were used to detect *P. falciparum* and *P. vivax* in wild caught *An. Farauti*. The sensitivity and specificity of these two methods for the detection of malaria parasites were compared. Although,

"...nested PCR showed 100% sensitivity for both P. vivax and P. falciparum. While the sensitivity of ELISA for P. vivax was only 35%, its specificity was 100%.... Overall, the present study indicates that PCR could detect malaria parasites in mosquitos with a high level of sensitivity."

there was not much difference between ELISA and PCR with reference to specificity, PCR had relatively higher sensitivity in detecting both *P. falciparum* and *P. vivax* when compared to the ELISA. The detection of *P. falciparum* DNA in wild caught mosquitos with low parasite infection indicated an advantage of the PCR over ELISA. The PCR technique was able to identify the presence of *P. falciparum* DNA in 4 or 5 wild caught mosquitos which were negative by ELISA, which requires at least 100 sporozoites per assay. In the present study it was found that nested PCR showed 100% sensitivity for both *P. vivax* and *P. falciparum*. While the sensitivity of ELISA for *P. vivax* was only 35%, its specificity was 100%. Overall, the present study indicates that PCR could detect malaria parasites in mosquitos with a high level of sensitivity. The PCR could be considered for processing large number of samples in operational programs, mapping areas with different levels of endemicity and stratifaction of areas, provided the technique is further refined to have higher specificity.

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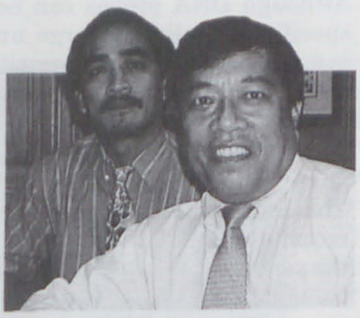
RELATIVELY HIGH INCIDENCE OF RICKETTSIAL INFECTION IN SEMI-NOMADIC PENANS OF UPPER REJANG RIVER



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Typhus, an acute fibrile illness caused by infection with various Rickettsia species such as *Rickettsia* (Orientia) *tsutsugamushi, R. typhi* and TT118 rickettsiae, is common in many Southeast Asian countries. In Malaysia, the yearly incidence of typhus in rural West Malaysia is more than 3% with high prevalence rate among forest and oil palm workers. Among forest dwelling Orang Asli of Peninsular Malaysia, the monthly incidence of typhus is about 3.5%. In East Malaysia, although the incidence of scrub typhus in Sabah is low, 16.5% of forest dwellers surveyed were seropositive for tick typhus. In Sarawak, more than 24% of febrile illness in rural areas may be due to typhus, with tick typhus being more common than scrub typhus. In remote interior villagers in Sarawak, tick typhus may be common due to greater contact with small wild rodents infected with TT118 rickettsiae.

A few years back, a group of researchers from Unimas embarked on a study to determine the prevalence of typhus among the longhouse communities of the upper Rejang River basin. The locality was selected for study because this demographically unique area, the size of Singapore, is inhabited by nine indigenous interior tribes (Orang Ulu) including the Penans, Ukits, Kayans, Kenyahs, Lahanans, Kajangs, Punans, Badangs and Kejamans. For generations, these ethnic tribes have been dependent on the forests and rivers for their daily meat, fish and jungle vegetable requirement, and therefore were expected to have greater contact with the vectors of typhus in their environment. As the area is undergoing a RM13 billion Bakun hydroelectric project development which necessitates the resettlement of these longhouses and villages to a new area, a baseline study on the prevalence of typhus is essential for future reference point in any follow-up studies of the resettled villagers.

Of the sixteen villages and longhouses in the area (population ~ 9,000), five were selected (population ~ 5,000) for this study. Of those surveyed, 9.6% were seropositive for typhus of which 16 were female and nine were male. Using the indirect immunoperoxidase test, 3.8% were confirmed seropositive for tick typhus (7/11), scrub typhus (4/11) or endemic typhus (1/11). The seroprevalence of typhus ranged from 2.0 to 7.1% with the highest incidence found among the semi-nomadic Penans of Lesong Laku.

The finding that 3.8% of the Orang Ulus surveyed in upper Rejang River were seropositive for recent rickettsial infection showed that the incidence of typhus in rural Sarawak is similar to that of rural West Malaysia. In East Malaysia, tick typhus is more common than scrub typhus. Its incidence among the Orang Ulu is lower than among forest dwellers in Sabah.

In previous studies higher incidence of typhus was found among forest workers, forest dwelling Orang Asli and oil palm workers. The present study showed that the incidence of typhus was higher among the semi-nomadic Penans of Lesong Laku (7.1%) compared with the settled Kayans of Long Murum. The higher incidence of typhus among the Penans may be due to greater contact with the vectors of typhus in their forest environment. The present data taken together with previous data appear to suggest that tick typhus may be the most common rickettsial infection is rural Sarawak. The high incidence of tick typhus in rural Sarawak may be associated with the high rate of natural infection of small wild rodents with TT118 rickettsiae as previously found in Selangau Sarawak. High prevalence of natural infection of small rodents with TT118 rickettsiae would suggest higher natural transmission of tick typhus.

"The higher incidence of typhus among the Penans may be due to greater contact with the vectors of typhus in their forest environment. The present data taken together with previous data appear to suggest that tick typhus may be the most common rickettsial infection is rural Sarawak"

Reference:

Dominic D Sagin, Ghazally Ismail, Leo M Nasian, Jonathan J Jok and Eugene KH Pang (2000) Rickettsial infection in five remote Orang Ulu villages in Upper Rejang River, Sarawak, Malaysia. *Southeast Asian J Trop Med Public Health*. Vol 31 No 4 1-3

BIODIVERSITY

NEW RECORD OF ENDEMIC BORNEAN FRESHWATER CROCODILE FROM BRUNEI

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Crocodylus raninus Müller & Schlegel (1844), the endemic Bornean freshwater crocodile, was described on the basis of a juvenile collected by the French naturalist, Pierre Menard Diard at Pontianak, Kalimantan Barat, Indonesia and one listed by Lidth de Jeude (1898) that was collected by Salomon Müller in 1836 from the Banjer River, a tributary of Sungai Barito, Kalimantan Tengah, also in Indonesia. While collecting zoological specimens in 1878 for American museums, William T. Hornaday collected a crocodilian from an unspecified locality in Borneo. Since Hornaday's collection activities were confined to Sarawak, Ross (1990) tentatively assigned this crocodilian specimen as an additional collection from Borneo without any data on its exact provenance. In the next 100 years, no further specimens of this palustrine crocodile were collected. Since 1889, several zoologists working on crocodilian species of the region have in fact relegated the name *Crocodylus raninus* to the synonymy of the widespread *Crocodylus porosus* Schneider. The irony here is that C. porosus is an estuarine species and therefore potentially not ecologically syntopic. Ross (1990) revived *C. raninus* as a distinct species, and subsequently designated a lectotype. It was later recognized as valid by Manthey & Grossman (1977). Since then, little has appeared on the systematics and biology of the species, and precise locality records for this Bornean endemic are few. Most recently, Ross *et al.* (1998) recorded two specimens at a crocodile farm in Banjarbaru that they assigned to the *raninus* group of crocodiles that were reportedly collected from Pangkalanbun, central Kalimantan, Indonesia.

In February 1990, Webber Booth of Universiti Brunei Darussalam collected a complete skull of a juvenile crocodilian from the surface of the muddy shores of Tasek Merembun, Tutong District, Brunei Darussalam. In an effort to correctly identify this rare collection, Indraneil Das of Unimas and Joseph Charles of University Brunei Darussalam (UBD) have re-examined several pertinent taxonomic features of

"... assign the skull to* Crocodilus raninus *Müller & Schelegel (1844). Given that Ross' (1990) record of* Crocodylus raninus *was from a local crocodile farm in Kalimantan, the new locality from Brunei is of considerable interest"

the skull which is currently housed at the UBD. They assign the skull to *Crocodilus raninus* Müller & Schelegel (1844). Given that Ross' (1990) record of *Crocodylus raninus* was from a local crocodile farm in Kalimantan, the new locality from Brunei is of considerable interest. Ross *et al.* (1998) was informed by knowledgeable local sources that the species is referred to as *Buaya salak*, literally barking crocodile, in central Kalimantan, and in the Sungai Sebingit region, the species is suspected to be locally extinct. The second hand report in Cox and Gombek (1985) of a crocodilian similar to *C. siamensis* from Kelauh, Seterap and Dor tributaries of the Batang Lupar, may be based on *raninus* as well. The record from Tasek Merembun shows that *Crocodylus raninus* occupies patchy swamps.

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AQUATIC BIOLOGY

CONSIDERATIONS AND PRACTICAL APPLICATIONS OF GAMMA IRRADIATION FOR GENETICALLY MODIFIED AQUATIC ORGANISMS

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"In the irradiation of gametes, aquatic organisms, and other biological materials, it is desirable that samples receive equal and uniformly distributed doses. Their investigation demonstrated the criticality of careful dosimetry be carried out before experimentation and that the same medium be used to place the specimen under study"

Ionizing radiation is commonly used to eliminate chromosome sets in fish and other aquatic organisms to produce androgenesis (all-paternal) and gynogenesis (all-maternal inheritance). Androgenesis and gynogenesis have numerous potential applications, including the generation of homozygosity. Ionizing radiation is routinely used to sterilize pest insect species and also to induce sterility in some fish species. Reproductively sterile individuals reduce the potential hazards caused by the introduction of exotic species or genetically modified organisms. In these studies, gametes or organisms were exposed to a broad range of doses of ionizing radiation in various containers to obtain the desired results. It is crucial that careful dosimetry be performed before carrying out irradiation experiments on specimens in different medium such as for aquatic organisms. Such measurements are typically not reported or are not performed in irradiation studies of aquatic organisms. Experimental errors in dosimetry used would complicate comparisons among different studies and organisms employed. This has to an extent hindered development and application of valuable techniques such as radiation-induced sterilization of genetically modified organisms.

Radiation affects cells primarily by damage to nuclear DNA through base damage, single strand breaks, or double strand breaks. These breaks may result in chromosomal aberrations that prevent proper distribution and replication of the chromosomes and their transmission to daughter cells during cell division. Lee Nyanti of Unimas and his co-investigators from Louisiana State University USA used intensive dosimetry to determine the variation in dosage possible in irradiation of aquatic organisms. They have succeeded in establishing an irradiation protocols for aquatic animals and identified some of the factors that need to be considered when water is used as a surrounding medium. They have also determined the dose rates at various positions inside an irradiation container. In the irradiation of gametes, aquatic organisms, and other biological materials, it is desirable that samples receive equal and uniformly distributed doses. Their investigation demonstrated the criticality of careful dosimetry be carried out before experimentation and that the same medium be used to place the specimen under study. They also showed that the sources of variation included position within the container, surrounding medium, and whether or not the container was rotated.

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RESEARCH UPDATE

WHAT IS THOUGHT TO MAKE END-USER COMPUTING SUCCESSFUL?

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While organizations have been pouring huge sums of money into providing their office workers with personal computers (PCs), little real understanding of the benefits that emerge from these expenditures has come forth. Academics have sought to unravel the complexities of organizational life as it is affected by the introduction of computers. Two decades of research activity has unveiled a number of common threads which are generally thought to be conducive to the successful deployment of PCs.

Since PCs made their first faltering steps into organizational life in the early 1980s, they have evolved from the status of a toy to that of an indispensable and ubiquitous general purpose information processing and communication tool. During this time, there have been many changes in the type of people using them and the purposes to which they have been put. Nevertheless, success with PCs, or with end-user computing has been a tough notion to tie down. One criteria that has come to overshadow most others was that of user satisfaction. The reasoning is that if a computer user is satisfied with the results of using the computer, then it has been successful.

Roger Harris of Unimas recently reviewed the schools of thought that have emerged into end-user computing success. Research findings from nearly 20 years of studies suggest that a combination of factors will influence the extent to which any computer user will be satisfied with the use of his/ her computer. The first factor relates to the individual characteristics of the user. Personality can influence the satisfaction of a user, as can the leadership style of computer managers. Training, attitudes, responsibility and commitment to change are also likely to influence satisfaction with PCs. The second factor is associated with the characteristics of the particular application that the user is using. Information from the computer system should be accurate, useful, easy to read and timely, and the system should be easy to use. The next factor is concerned with aspects of the organization in which the computer user works. Company policies for PCs will influence satisfaction with their use, as will organizational support. Additionally, the expectations and desires that a user develops with regard to his/ her use of computers will significantly affect the degree of satisfaction. Similarly, attitudes towards computers, computer anxiety and the perceived usefulness of computers will all have some influence on the extent to which computer users will be satisfied with their experiences.

In summary, the cumulative results of the body of research into end-user computing success suggest three prime sets of influences. The first one concerns the individual user, in that some individuals will be more likely to enjoy their use of computers and to achieve satisfaction than will others. The second set of indicators relates to the application that is being used and the third set relates to the organization in which the user works. Necessarily, there will be cross influences between these influences. Individuals affect the shape of the organization in which they work and computer applications often have profound effects on the way individuals approach their jobs. As PCs grow in capability and spread even further into our daily lives, yet more questions are raised as to what will be the impact on individuals who will increasingly be called upon to accommodate new working methods and responsibilities, and how organizations can adapt their structures and their working practices in order to take advantage of new technologies and to achieve that ever elusive conception of success with end-user computing.

"...end-user computing success suggest three prime sets of influences. The first one concerns the individual user, in that some individuals will be more likely to enjoy their use of computers and to achieve satisfaction than will others. The second set of indicators relates to the application that is being used and the third set relates to the organization in which the user works."

Reference:

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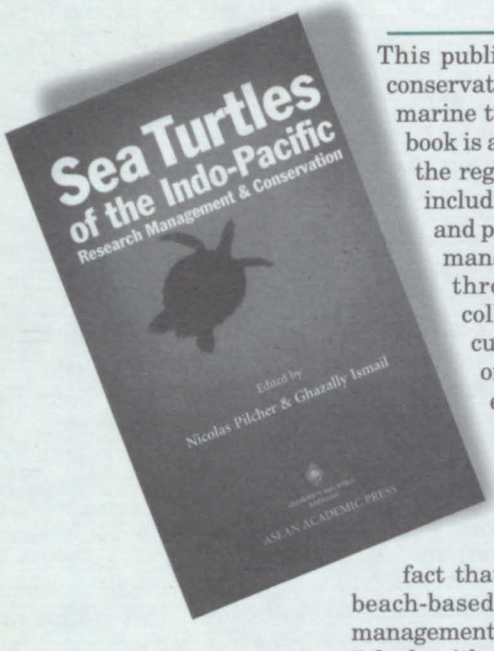
NEW BOOKS BY UNIMAS STAFF

SEA TURTLES OF THE INDO-PACIFIC: RESEARCH MANAGEMENT & CONSERVATION



This publication contains some of the most up-to-date references on turtle conservation, especially so for the Indo-Pacific region. Given the current decline of marine turtle populations throughout the globe, but in SE Asia in particular, the book is a timely contribution to research, management and conservation efforts in the region today. Several chapters address current research in the Indo-Pacific including genetics, egg shell morphology, satellite telemetry, hatchery suitability and predation on hatchling turtles. Conservation, community participation and management practices are described for numerous countries, from Pakistan through South and Southeast Asia and down to Australia. Regional collaboration, world-wide conservation and cooperation approaches and current threats are addressed in chapters on the Inter-American Convention on Sea Turtle Conservation, the history of TED development, use and enforcement, and possible regional cooperation agreements. Section 1 on Management and Conservation contains papers describing the conservation status and management approaches in a number of ASEAN and non-ASEAN nations. Section 2 on Nesting and Foraging Populations describes a number of sea turtle populations in the Indo-Pacific area. Section 3 follows the main theme of the conference which highlights the fact that many conservation and management approaches are not necessarily beach-based, such as hatcheries and incubators. Section 4 covers research and management on turtle populations before they enter the sea as hatchlings, while Section 5 deals with ways in which we may help turtle populations. Finally, Section 6 discusses TEDs and the road ahead, a major issue in today's turtle conservation efforts, particularly after the recent USA/Asia market disputes.

This book is now one of the most up-to date sources of information on sea turtle projects in the region, and serves as a useful guide to literature which was previously unknown. The book will serve as a valuable reference to sea turtle biologists, not simply in the Indo-Pacific region, but worldwide, given turtle's migratory habits, and will provide a reference to key documents and publications, including legislation, otherwise unknown literature, and national management plans. This volume will be invaluable to researchers, government officials, educators and is presented in such away as to make it easy to read and understand.

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Ghazally Ismail

Publisher :
Asean Academic Press
Universiti Malaysia Sarawak
ISBN 1-901919-22-6

VIRTUAL REALITY: SELECT ISSUES AND APPLICATIONS

Virtual Reality (VR) will emerge as a significant extension to the way we interact with computer systems within the next decade. It is envisaged to greatly improve our individual and shared understanding of real or imaginary environments. Users of VR technologies will be able to interact in real-time with a computer-generated environment in a simple, 'natural' manner, without the need for extensive training. Applications of its use in the business community are now emerging which give competitive business advantage. It has been said that "If a picture is equivalent to a thousand words, VR may be equivalent to a thousand sentences. VR is not just the picture but a simulation of the entire process where the user participates and is able to perceive his/her presence in the simulated environment". This publication presents a comprehensive introduction to VR from the perspectives of ergonomics usability, design engineering, software development, cognitive and educational implications. In essence, it is a review of pertinent issues in design and application of VR. This book is illustrated with examples from current research, thus making this an insightful reference for researchers in Virtual Reality as well as students from engineering, information technology and cognitive science background. Several of the chapters illustrate local VR applications including from Southeast Asia.

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Publisher
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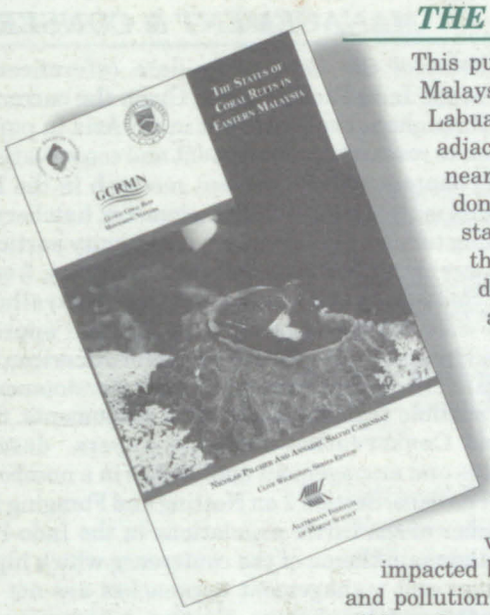
THE STATUS OF CORAL REEFS IN EASTERN MALAYSIA



This publication represents the most current status of the coral reefs in Eastern Malaysia. The Malaysian States of Sabah and Sarawak and the Federal Territory of Labuan, directly contiguous with the reefs of the Philippines and the Sulu Sea, are adjacent to the highest concentrations of coral reef diversity. Coral reefs occur along nearly the entire coastline and surround most islands in Sabah. The survey was done between 1996 and 1999 using methods in keeping with the AIMS-ASEAN standards. The report contains the condition of the coral reefs with respect to their distribution and 'health' rating, percent area of the benthos cover and destruction. The reefs of Sabah has been significantly degraded by natural events and several anthropogenic activities such as over-fishing, blast fishing, and muro ami. The coral reefs surveyed included those close in proximity to human settlements and thus most threatened by human activities such as those in the Darvel Bay, Marudu Bay, off Kudat, Banggi and Balambangan islands. Data also revealed the dramatic decline in live coral cover in the western coast of Sabah since 1994. At the Tunku Abdul Rahman Park, reefs were damaged in 1996 by tropical storm Greg. Many previously healthy reefs with greater than 30 % live coral cover had been reduced to rubble fields with less than 5 % cover. In all the reefs, fish populations have also been heavily impacted by artisanal fishing. In Sarawak the reefs are threatened by sedimentation and pollution from land. In the northeast, the most abundant coral reefs are among the offshore Luconia shoals. The nearshore reefs were threatened by pollution and sediments from the Miri and Baram rivers. The combined effects of sedimentation and nutrients could have a major impact on these reefs, especially those closer to the dredging concession, if action is not taken. The reefs at the southwest, including the Talang Talang island reefs were typically sparse and undeveloped, lying in the heavily silted waters that flow from the numerous rivers. The seabed was mostly sandy with rock and dead coral boulders. The publication also discusses the major obstacles facing East Malaysia's marine parks in the protection and enforcement of regulations to protect coral reefs. Coral reefs are not considered among the top tourism attractions, and receive less than their fair share of funding and attention by enforcement officers. Suggestions were included to strengthen enforcement capacity which include investing more heavily in enforcement, in terms of both personnel and funding, the development of additional Marine Reserves and implementation of education programs that include alternative livelihood projects. The development of a local reef ownership concept may be one of the best conduits towards effective enforcement of management guidelines. The ability to assign ownership is probably the only major stumbling block in the process, but once overcome, it is possible that communities will be better able to enforce rules than law enforcement personnel.

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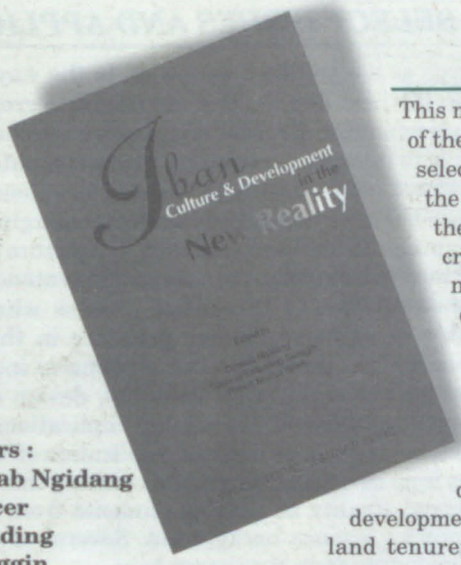
Publisher :
Global Coral Reef Monitoring Network

IBAN CULTURE AND DEVELOPMENT IN THE NEW REALITY



This monograph highlights the achievements, success, failures and future directions of the Iban community of Sarawak in the new millennium. It is a collection of seven select papers dealing with a range of topical issues relevant to trace and understand the path of change in this community's immediate past and allowing them to chart their progress into the new future. Among the impassioned and pertinent issues critically dealt with in this publication are Iban culture and value systems, the native customary land development and their economic well-being and contributions in Sarawak. Indeed a full grasp and heightened awareness of the challenges and opportunities confronting this community today may well lead to a phenomenal solution for uplifting the status of the Iban community in Sarawak to greater heights. Scholars and students of this community are invited to ponder over the reconstruction of a meaningful "Iban Development Path" which must draw up clear signposts for their own socio-economic development. These include issues on the relationship between culture and development; the implications of native customary land development on the security of land tenure; the cost-benefit analysis of land development and subsidy schemes; the assessment of the strength and weaknesses of past development strategies; the crucial roles of grassroots institutions and organizations in community development; the rural-urban drift, school dropouts, unemployment, prostitution and other social problems besetting the community; the Iban participation in commerce and industries; the roles of community structure and Iban leadership in development, and how does Iban leadership structure influence the community value systems and set the community's future direction.

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Dimbab Ngidang
Spencer Empading Sanggin
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